

# 3-PART TINSSL WEBINAR SERIES: UNDERSTANDING AND EVALUATING LM-79 AND LM-80 TEST REPORTS FOR SSL TECHNOLOGY

Day 1: *Understanding & Evaluating LM-79 Reports*  
August 10, 2010: 12:00 - 1:30pm EST

Day 2: *Understanding & Evaluating In Situ TMP & LM-80 Reports*  
August 11, 2010: 12:00 - 1:30pm EST

Day 3: *Walking Through Examples of Real LM-79 & LM-80 Reports*  
August 12, 2010: 11:00am - 12:30pm EST

Hosted by the U.S. Department of Energy and Northeast Energy Efficiency Partnerships



# Northeast Energy Efficiency Partnerships



[www.neep.org](http://www.neep.org)

REGIONAL INITIATIVES

PUBLIC POLICY

EM&V FORUM

NEEP SUMMIT

## ABOUT NEEP



NEEP is a non-profit organization that facilitates regional partnerships to advance the efficient use of energy in homes, buildings and industry in the Northeast U.S. NEEP works to leverage knowledge, capability, learning and funding through regionally coordinated policies, programs and practices.

As a regional organization that collaborates with policy makers, energy efficient program administrators, and business, NEEP is a leader in the movement to build a cleaner environment and a more reliable and affordable energy system.

[\[More\]](#)

# DOE Technical Information Network



## “One & Done” Connection to DOE’s SSL Work

- DOE's Technical Information Network for Solid-State Lighting (TINSSL) increases awareness of SSL technology, performance, and appropriate applications.
- TINSSL members receive regular updates on technical progress of SSL technologies, upcoming meetings and events that address market issues related to SSL, and outreach materials developed for target audiences.
- Coverage includes:
  - CALiPER
  - Gateway Demonstrations
  - Lighting Facts
  - L Prize



The DesignLights™ Consortium (DLC) is the Northeast's premier resource for high-quality, energy-efficient, commercial lighting design and information!

The DLC — a collaboration of utility companies and regional energy efficiency organizations — is committed to raising awareness of the benefits of efficient lighting in commercial buildings.

**OUR SPONSORS** support and enable the efforts of the DLC, and through their participation they demonstrate their commitment to quality and performance in energy efficiency.

**OUR MISSION** is to help — builders, architects, designers, and commercial property owners to implement improved design practices in all areas of the commercial lighting market.

**OUR GOAL** is to ensure that high-quality, energy-efficient lighting design becomes commonplace in all lighting installations.

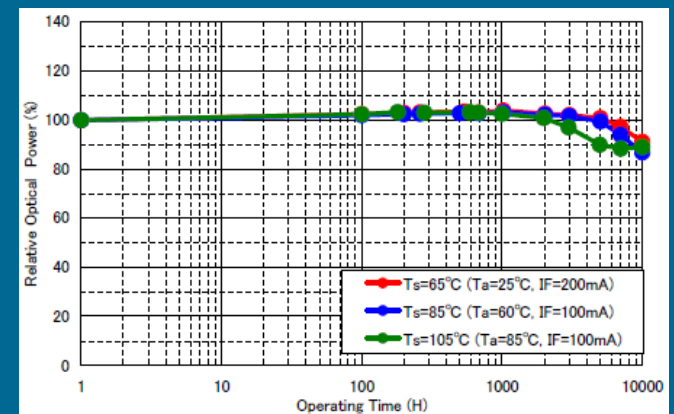
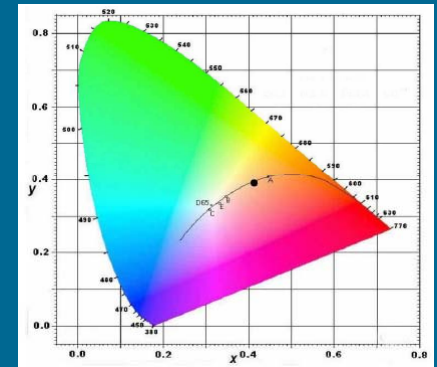
## NEWS

### Highlights

*The DesignLights Consortium Qualified Products List project was presented at the DOE SSL Market Introduction Workshop, July 20-22, Philadelphia, PA*

EFFICIENT LIGHTING PRODUCTS + EFFICIENT LIGHTING DESIGN = SMART LIGHTING

## Day 3: Walking Through Examples of Real LM-79 & LM-80 Reports



Three-Part TINSSL Webinar Series:  
Understanding and Evaluating  
LM-79 and LM-80 Reports

**Kelly Gordon**

**Jason Tuenge**

Pacific Northwest National Laboratory

August 12, 2010

# Sample Submittal #1

U.S. DEPARTMENT OF  
**ENERGY**

Energy Efficiency &  
Renewable Energy

## DESCRIPTION

A series of undervolted, balanced lampholders. The States family of lampholders feature die cast and extruded bodies with elegant free flowing lines. Ideal for accent and display lighting applications. This States LED Medium lampholder is perfect for those applications where performance is required from a discreet source.

Catalog #	Type
Project	
Comments	
Prepared by	

## SPECIFICATION FEATURES

### Quick-Lock Adapter

Attaches electrically and mechanically anywhere along track. Includes discolor locking tab that locks lampholder on track and allows for easy removal and repositioning. Two position conductor allows use in single circuit and either circuit of two circuit track.

### Lockable Aiming

Lampholder tilt and rotation can be locked in place easily with the included 1.5mm allen wrench.

### Switch

On-off switch allows power to be turned off during installation on individual lampholders.

### Driver Housing

Die cast and extruded aluminum housing incorporates the lamp control circuit.

### Heat Sink

Aluminum die cast provides exceptional thermal management to yield 70% lumen maintenance after 50,000 hours of operation.

### Lampholder Arm

Arm allows the housing tilt to adjust  $\pm 0.00^\circ$ . It also pivots  $\pm 0.00^\circ$  around the driver housing. This enables the driver housing to remain static on the track creating a clean look, while providing full aiming capabilities. The arm employs graduations every  $15^\circ$  for precise and repeatable tilt aiming. Indicator mark on the bottom ensures perfect lamp housing alignment with track.

### LED Light Engine

Equipped with (7) 3 Watt white LEDs. Factory configurable optics allow for 3 optical distributions. High CRI of 85 with excellent color consistency of a 50K color temperature.

### Labels

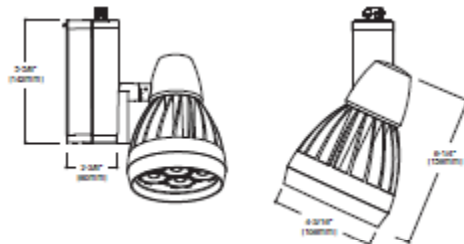
UL/UL Listed for use with Halo Architectural Power-Trac and Laser Trac.



15W

Medium

Power Trac



## ORDERING INFORMATION

Track	Adapter	Driver	Optics	Label	Mounting
15W LED POWER TRACK	15W LED ADAPTER	15W LED DRIVER	15W LED OPTICS	15W LED LABEL	15W LED MOUNTING
15W LED POWER TRACK	15W LED ADAPTER	15W LED DRIVER	15W LED OPTICS	15W LED LABEL	15W LED MOUNTING

Model	Power
15W LED	15W
15W LED	15W
15W LED	15W

Model	Power
15W LED	15W
15W LED	15W
15W LED	15W

Model	Power
15W LED	15W
15W LED	15W
15W LED	15W

ACT/001006  
2/10/10

## ACCESSORIES

### Media Holder - Provides a 24 hour media

LM1050 Media Holder



Media Holder

### LED Series Color Filter

Color Filter 3.50\"/>

LED-Medium PWS color filter  
LED-Medium PWS color filter  
LED-Medium PWS color filter  
LED-Medium PWS color filter  
LED-Medium PWS color filter  
LED-Medium PWS color filter  
LED-Medium PWS color filter



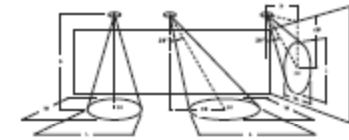
Color Filters

## PHOTOMETRICS

Color Temp. = 3000K 4000K Multiplier: 1.25	0° Aiming Angle Horizontal Footcandle	30° Aiming Angle Horizontal Footcandle	30° Aiming Angle Vertical Footcandle on Wall	60° Aiming Angle Vertical Footcandle on Wall
Spot: 37°	D FC L W CB	D FC L W CB	D FC L W CB	D FC L W CB
CRCP: 26079	75 100 100 0.0	75 100 100 0.0	75 100 100 0.0	75 100 100 0.0
Lumens: 900	100 260 1.2 1.2	100 260 1.2 1.2	100 260 1.2 1.2	100 260 1.2 1.2
Report No: A10108	125 231 1.5 1.5	125 231 1.5 1.5	125 231 1.5 1.5	125 231 1.5 1.5
	150 180 1.8 1.8	150 180 1.8 1.8	150 180 1.8 1.8	150 180 1.8 1.8
Narrow Flood: 25°	D FC L W CB	D FC L W CB	D FC L W CB	D FC L W CB
CRCP: 3044	75 54 5.4 3.4	75 54 5.4 3.4	75 54 5.4 3.4	75 54 5.4 3.4
Lumens: 750	100 30 4.4 4.4	100 30 4.4 4.4	100 30 4.4 4.4	100 30 4.4 4.4
Report No: A10112	125 10 5.7 5.7	125 10 5.7 5.7	125 10 5.7 5.7	125 10 5.7 5.7
	150 14 6.8 6.8	150 14 6.8 6.8	150 14 6.8 6.8	150 14 6.8 6.8
Flood: 40°	D FC L W CB	D FC L W CB	D FC L W CB	D FC L W CB
CRCP: 1726	75 30 3.0 3.0	75 30 3.0 3.0	75 30 3.0 3.0	75 30 3.0 3.0
Lumens: 600	100 17 4.0 4.0	100 17 4.0 4.0	100 17 4.0 4.0	100 17 4.0 4.0
Report No: A10114	125 9 4.7 4.7	125 9 4.7 4.7	125 9 4.7 4.7	125 9 4.7 4.7
	150 8 5.6 5.6	150 8 5.6 5.6	150 8 5.6 5.6	150 8 5.6 5.6

### Notes and conditions:

Beam spread is to 50% center beam diameter (CB) at distance of 1m to foot of wall.  
FC=footcandle on foot of wall at center beam aiming location.  
L=effective beam beam length in feet (ft) or maximum beam length (m).  
W=effective beam beam width in feet (ft) or maximum beam width (m).  
CB=distance in feet (ft) or down to center beam location.



Note: specifications and dimensions subject to change without notice.  
Visit our website at [www.cortlandlighting.com](http://www.cortlandlighting.com)  
Customer first call 1-877-447-7447 or 1-800-447-7447. Call 1-800-447-7447 or 1-800-447-7447.  
Cortland Lighting Inc. 1100 Highway 20 South, Suite 100, Cortland, Ontario, Canada L1R 4B5. Fax 1-800-447-7447.

# Sample Submittal #1

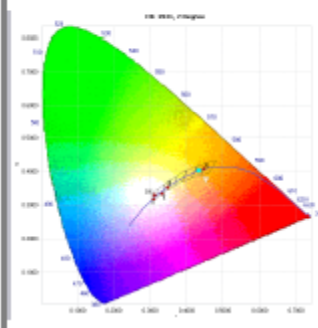
**LTL** LUMINAIRE TESTING LABORATORY, INC. SUSTAINING MEMBER of the IESNA

909 Harrison Street • Allentown, PA 18104 • 610-770-1044 • Fax 610-770-8912 • [www.LuminaireTesting.com](http://www.LuminaireTesting.com)  
LTL Number: 18088  
Prepared For: XXXXXXXXXX Date: 02-23-2010  
Catalog Number: XXXXXXXXXX  
Luminaire: Cast black enamel aluminum heatsink housing, no enclosure.  
Lamp: Seven white LEDs with clear plastic optics and fresnel center sections below each.  
LED Power Supply: One XXXXXXXXXX  
Luminaire Efficacy: 41.7 Lumens/Watt

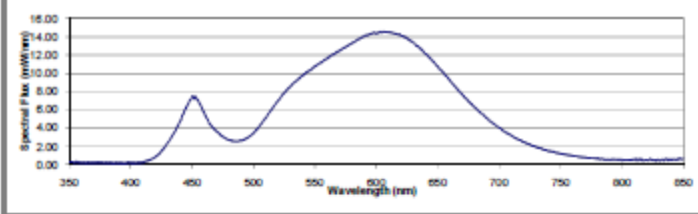
Luminaire Input Voltage	Input Current	Luminaire Watts	Power Factor
120 DVAC	0.1561A	18.57W	0.991

Radiant Flux mW	Luminous Flux lumen	Corr. Color Temperature K	Color Rend. Index Ra
2553.00	774.100	3051	81.7

Chroma X	Chroma Y	Chroma U	Chroma V
0.4337	0.4038	0.2486	0.3472



Wavelength in nm	Spectral Flux in mW/nm	Wavelength in nm	Spectral Flux in mW/nm
350	0.2529	610	14.4790
360	0.2086	620	14.1182
370	0.2031	630	13.3706
380	0.2306	640	12.1288
390	0.2028	650	10.7652
400	0.2063	660	9.1881
410	0.2494	670	7.6571
420	0.8215	680	6.2855
430	2.3497	690	5.0718
440	4.6810	700	4.0364
450	7.4434	710	3.1652
460	5.6626	720	2.4730
470	3.6204	730	1.9410
480	2.7421	740	1.4800
490	2.6411	750	1.2372
500	3.4299	760	0.9690
510	5.1199	770	0.7647
520	6.9799	780	0.7285
530	8.5371	790	0.5231
540	9.7404	800	0.4484
550	10.7590	810	0.5376
560	11.6269	820	0.5120
570	12.4733	830	0.5240
580	13.2827	840	0.5950
590	14.0123	850	0.6688
600	14.3343		



TESTING WAS PERFORMED IN ACCORDANCE WITH IES LM-79-08. Approved By: *JG*

**Track Thermal Test**  
Low Voltage Incandescent

Request No. 2091277 Request Date 6/29/2009 Engineer HERMAN Project# DMV7-0074  
Catalog No. XXXXXXXXXX Trim XXXXXXXXXX Product Outline File st59 Trend File XXXXXXXXXX  
Special Instructions XXXXXXXXXX

**Lamp** Lab No. XXXXXXXXXX  
Mfg. XXXXXXXXXX Wattage XXXXXXXXXX Type LED ANSI No. XXXXXXXXXX

**Test Ceiling** E-2051

**Transformer**  
Manufacturer XXXXXXXXXX Catalog Number LP1020-24-C0700  
Prim. Rating Volt XXXXXXXXXX Amps XXXXXXXXXX Watts XXXXXXXXXX Freq. XXXXXXXXXX  
Sec. Rating Volt 12-24 Amps XXXXXXXXXX Watts 20 Freq. XXXXXXXXXX

**Control Variables** Station Number 12  
Setpoint 120 Vols Min Amps 0.1 Max. Test Duration 24 Hrs  
Fixture Orientation 2 Vertical

**Electrical Data**  
Input: Volts 119.9 Amps 0.154 Watts 18.2 Frequency 60

**Test Data** Duration 15.92 Hrs  
Test End 7/6/2009 7:40 AM Test Start 7/7/2009 3:45 PM  
Reason For Ending 5 Manual Termination

Description	RAW	Adj.	3 Hr Up	Td	St
1. DRIVER CASE	46.7	49	0	0	2
2. LED BOARD	80.8	51	0	0	2
3. POINT OF CONTACT	26.3	26	0	0	2
4. TRACK ADAPTER TOP	30.0	30	0	0	2
5. HOUSING BODY	36.2	36	0	0	2
6. HOUSING TOP	35.7	36	0	0	2
7. DRIVER HOUSING OUTSIDE	35.4	36	0	0	2
8. DRIVER HOT SPOT SEC	46.2	46	0	0	2
9. RUB BAR	26.9	26	0	0	2
10. RUB BAR SUPPORT	26.9	26	0	0	2
11. SWITCH JERKOFF	37.0	37	0	0	2
12. SOCKET CLIP	41.3	41	0	0	2
13. HOUSING TOP BY ADAPTER	35.1	35	0	0	2
14. LENS CENTER OUTSIDE	30.8	31	0	0	2
15					
16					
17					
18					
19					
20					
21					
22					
23					
24					
25					
26					
27					
28					
29					
30					
31					
32					
33					
34					
35					
36					
37					
38					
39					
40. AMBIENT	24.5	25	0	0	2

Comments: XXXXXXXXXX

Technician GONZALEZ Approved 7/6/2009 By: *John*  
Adjusted values are RAW values normalized to 25 °C then Truncated Printed: 7/6/2009 3:53:30 PM

# Sample Submittal #1

Cool White Results (Ta=25°C)

Cool White Results (Ta=25°C)

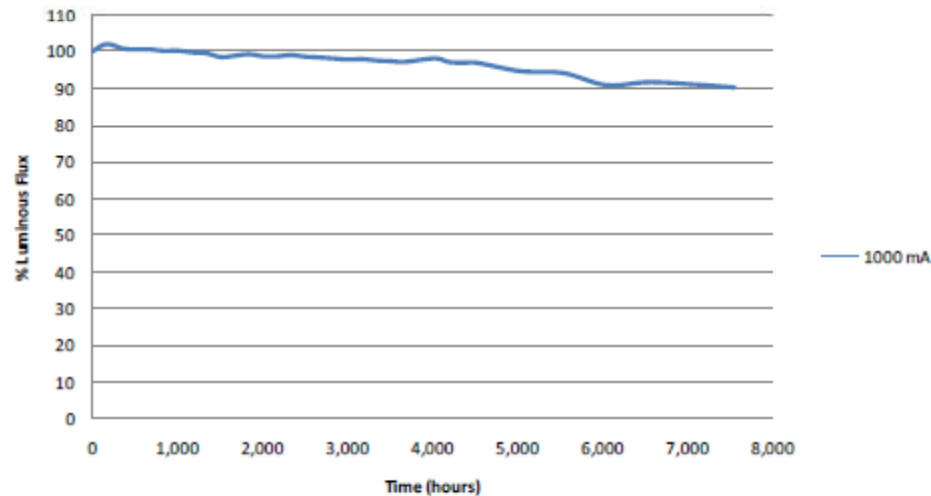
Cool White Results (Ta=45°C)

Cool White Results (Ta=45°C)

Cool White Results (Ta=85°C)

Cool White Results (Ta=85°C)

Current	Ta (°C)	Tsp (°C)	Tj (°C)
1000 mA	85	85	115



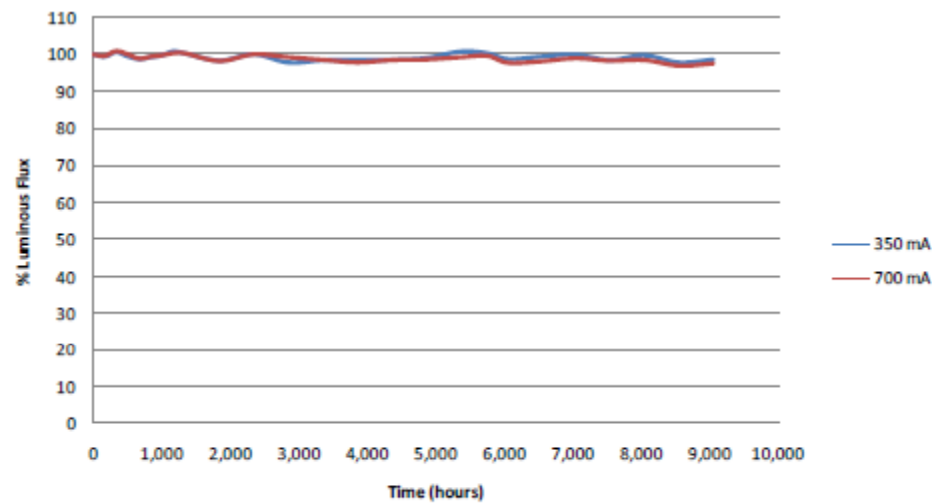


# Sample Submittal #1

## Warm White Results (Ta=25°C)



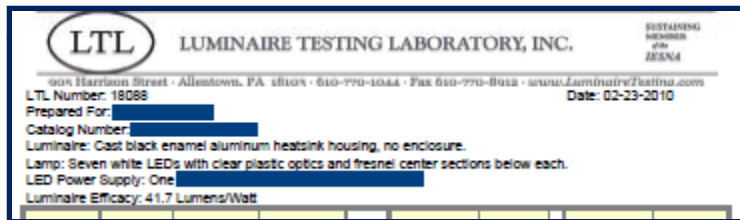
Current	Ta (°C)	Tsp (°C)	Tj (°C)
350 mA	25	42	51
700 mA	25	50	70



pg. 4

# LM-79 Checklist

☑ Report produced by a qualified test lab



[www1.eere.energy.gov/buildings/ssl/test\\_labs.html](http://www1.eere.energy.gov/buildings/ssl/test_labs.html)

(as of 8/4/10)

## Laboratories Performing Integrating Sphere Testing for CALiPER

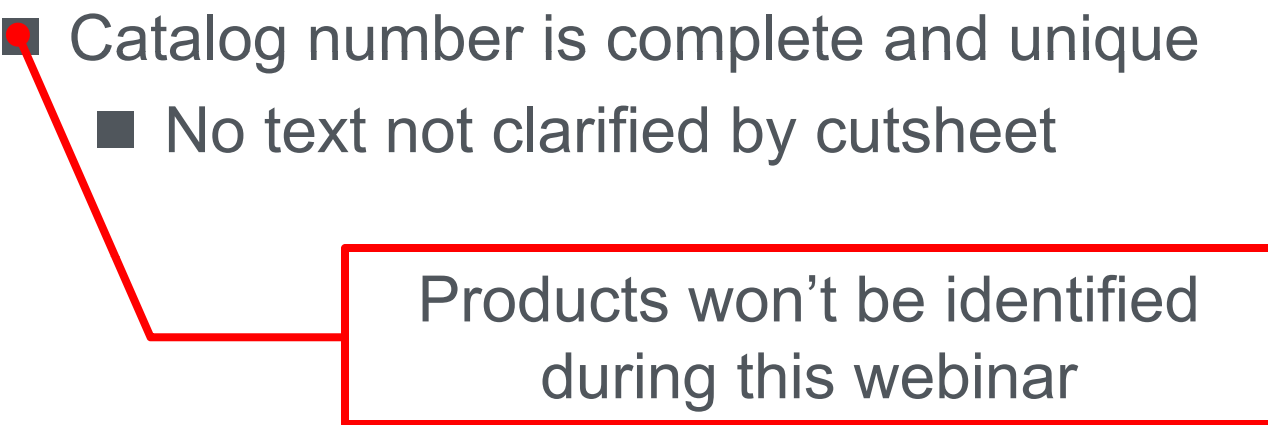
- [Independent Testing Laboratories Inc.](#) - Boulder, CO
- [Intertek](#) - Cortland, NY
- [Luminaire Testing Laboratory Inc.](#) - Allentown, PA
- [Lighting Sciences Inc.](#) - Scottsdale, AZ
- [OnSpeX/CSA International](#) - Atlanta, GA
- Aurora International Testing Laboratory ([PDF 3.0 MB](#)) - Aurora, OH
- [Orb Optronix Inc.](#) - Kirkland, WA

## Laboratories Performing Goniophotometry Testing for CALiPER

- [Independent Testing Laboratories Inc.](#) - Boulder, CO
- [Intertek](#) - Cortland, NY
- ➔ [Luminaire Testing Laboratory Inc.](#) - Allentown, PA
- [Lighting Sciences Inc.](#) - Scottsdale, AZ
- [OnSpeX/CSA International](#) - Atlanta, GA

- ☒ Data manipulation by supplier appears unlikely
  - ☒ PDF is preferred
  - ☒ Test lab letterhead (original)

- ☐ Consistent with submitted product and cutsheet\*
  - ☒ Catalog number is complete and unique
    - ☐ No text not clarified by cutsheet



Products won't be identified  
during this webinar

\* Or meets Product Group/Family criteria

# LM-79 Checklist

- ☐ Consistent with submitted product and cutsheet\*
  - ☐ Product description
    - ☐ Input current, voltage, and wattage
      - $120V \times 0.3A \times 0.92 = \mathbf{33W (?!)}$
      - *Input* current:  $0.3A_{\text{rated}} \neq 0.156A_{\text{measured}}$

<b>Energy Data:</b>	
Input Power:	18W
Power Factor:	>0.92
Input Current:	0.3 Amps

Luminaire: Cast black enamel aluminum heatsink housing			
Lamp: Seven white LEDs with clear plastic optics and fr			
LED Power Supply: One			
Luminaire Efficacy: 41.7 Lumens/Watt			
Luminaire Input Voltage	Input Current	Luminaire Watts	Power Factor
120.0VAC	0.1561A	18.57W	0.991
Radiant Flux mW	Luminous Flux lumen	Corr.Color Temperature K	Color Rend. Index Ra
2553.00	774.100	3051	81.7

\* Or meets Product Group/Family criteria

# LM-79 Checklist

- ☐ Consistent with submitted product and cutsheet\*
  - ☐ Product description
  - ☐ Input current, voltage, and wattage
    - Did the luminaire manufacturer mean *rated drive* current = 0.3A (300mA)?

<b>Energy Data:</b>	
Input Power:	18W
Power Factor:	>0.92
Input Current:	0.3 Amps

Luminaire: Cast black enamel aluminum heatsink housing			
Lamp: Seven white LEDs with clear plastic optics and fr			
LED Power Supply: One			
Luminaire Efficacy: 41.7 Lumens/Watt			
Luminaire Input Voltage	Input Current	Luminaire Watts	Power Factor
120.0VAC	0.1561A	18.57W	0.991
Radiant Flux mW	Luminous Flux lumen	Corr.Color Temperature K	Color Rend. Index Ra
2553.00	774.100	3051	81.7

\* Or meets Product Group/Family criteria

# LM-79 Checklist

- ☐ Consistent with submitted product and cutsheet\*
  - ☐ Product description
  - ☒ Number of LEDs

## LED Light Engine

Equipped with (7) 3 Watt white LEDs. Factory configurable optics allow for 3 optical distributions. High CRI of 85 with excellent color consistency of  $\pm 50^{\circ}\text{K}$  color temperature.

Luminaire: Cast black enamel aluminum heatsink housing  
Lamp: Seven white LEDs with clear plastic optics and fr  
LED Power Supply: One  
Luminaire Efficacy: 41.7 Lumens/Watt

Luminaire Input Voltage	Input Current	Luminaire Watts	Power Factor
120.0VAC	0.1561A	18.57W	0.991
Radiant Flux mW	Luminous Flux lumen	Corr.Color Temperature K	Color Rend. Index Ra
2553.00	774.100	3051	81.7

\* Or meets Product Group/Family criteria

# LM-79 Checklist

☐ Consistent with submitted product and cutsheet\*

☐ Product description

☒ CCT

CCT
30=3000K
40=4000K

Luminaire: Cast black enamel aluminum heatsink housin			
Lamp: Seven white LEDs with clear plastic optics and fr			
LED Power Supply: One			
Luminaire Efficacy: 41.7 Lumens/Watt			
Luminaire Input Voltage	Input Current	Luminaire Watts	Power Factor
120.0VAC	0.1561A	18.57W	0.991
Radiant Flux mW	Luminous Flux lumen	Corr.Color Temperature K	Color Rend. Index Ra
2553.00	774.100	3051	81.7

\* Or meets Product Group/Family criteria



# LM-79 Checklist

- ☐ Consistent with submitted product and cutsheet\*
  - ☐ Product description
    - ☒ No thermal management not indicated on cutsheet
    - ☒ Optical distribution *appears to be* worst-case
      - Optical accessories must be tested or excluded



Color Filters	
Glass Filters 3-3/4" (96mm) diameter. For use with [redacted] and [redacted] Media Holder.	<ul style="list-style-type: none"><li>=Medium Pink Color Filter</li><li>=Warm Red Color Filter</li><li>=Ultraviolet Filter</li><li>=Daylight Blue Color Filter</li><li>=Medium Blue Color Filter</li><li>=Medium Amber Color Filter</li><li>=Medium Green Color Filter</li><li>=Solite</li></ul>

Luminaire: Cast black enamel aluminum heatsink housing, no enclosure.  
Lamp: Seven white LEDs with clear plastic optics and fresnel center sections below each.  
LED Power Supply: One [redacted]  
Luminaire Efficacy: 41.7 Lumens/Watt

\* Or meets Product Group/Family criteria

# LM-79 Checklist

- ☑ No apparent errors attributable to manual entry
- ☑  $PF = 18.57W / 120V / 0.1561A$
- ☑  $Efficacy = 774 \text{ lm} / 18.57W$

Luminaire: Cast black enamel aluminum heatsink housing  
Lamp: Seven white LEDs with clear plastic optics and fr  
LED Power Supply: One  
Luminaire Efficacy 41.7 Lumens/Watt

Luminaire Input Voltage	Input Current	Luminaire Watts	Power Factor
120.0VAC	0.1561A	18.57W	0.991
Radiant Flux mW	Luminous Flux lumen	Corr.Color Temperature K	Color Rend. Index Ra
2553.00	774.100	3051	81.7

# ISTMT Checklist

- ☐ Report produced by a qualified test lab
- ☐ Data manipulation by supplier appears unlikely
  - ☒ PDF is preferred
  - ☐ Test lab letterhead (original)

**Track Thermal Test**  
Low Voltage Incandescent

Request No. 2091277 Request Date 6/29/2009 Engineer HERMAN Project# DM/7-0074

Catalog No. Trim Product Outline File st59 Trend File

Special Instructions

**Lamp** Lab No. Mfg Wattage Type ANSI No. LED

**Test Ceiling** E-2051

**Transformer** Manufacturer Catalog Number LP1025-24-C0700

Prim. Rating Volt Amps Watts Freq 100/240

Sec. Rating Volt Amps Watts Freq 12-24 20

**Control Variables** Station Number 12

Setpoint Min Amps Max Test Duration 120 Volts 0.1 24 Hrs

**Fixture Orientation** 2 Vertical

**Electrical Data** Input: Volts Amps Watts Frequency 110.9 0.154 18.2 60

**Test Data** Duration 15.92 Hrs

Test End 7/6/2009 7:40 AM Test Start 7/7/2009 3:45 PM

**Reason For Ending** 5 Manual Termination

Comments:

Technician GONZALEZ Approved 7/6/2009 By: [Signature]

Adjusted values are RAW values normalized to 25 C then Truncated

Printed: 7/6/2009 3:53:30 PM

	RAW	Adj.	3 Hr Up	Td	St
1 DRIVER CASE	46.7	49	0	0	0
2 LED BOARD	30.9	31	0	0	0
3 POINT OF CONTACT	26.3	26	0	0	0
4 TRACK ADAPTER TOP	30.0	30	0	0	0
5 HOUSING BODY	36.2	36	0	0	0
6 HOUSING TOP	35.7	36	0	0	0
7 DRIVER HOUSING OUTSIDE	35.9	36	0	0	0
8 DRIVER HOT SPOT SEC	45.2	45	0	0	0
9 RUB BAR	28.0	28	0	0	0
10 RUB BAR SUPPORT	28.0	28	0	0	0
11 SWITCH JERKOFF	37.0	37	0	0	0
12 MOUNT CLIP	41.3	41	0	0	0
13 HOUSING TOP BY ADAPTER	35.1	35	0	0	0
14 LENS CENTER OUTSIDE	30.9	31	0	0	0
15					
16					
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26					
27					
28					
29					
30					
31					
32					
33					
34					
35					
36					
37					
38					
39					
40 AVERAGE	24.9	25	0	0	0

- ☐ Consistent with submitted product and cutsheet\*
  - Catalog number
    - No portions not clarified by cutsheet
- ☐ Product description and photos or diagrams
  - ☐ No thermal management not indicated on cutsheet
  - ☐ Input current, voltage, and power
    - Inputs do agree with LM-79

<b>Energy Data:</b>	
Input Power:	18W
Power Factor:	>0.92
Input Current:	0.3 Amps

<b>Electrical Data</b>			
Input: Volts	Amps	Watts	Frequency
119.9	0.154	18.2	60

\* Or meets Product Group/Family criteria

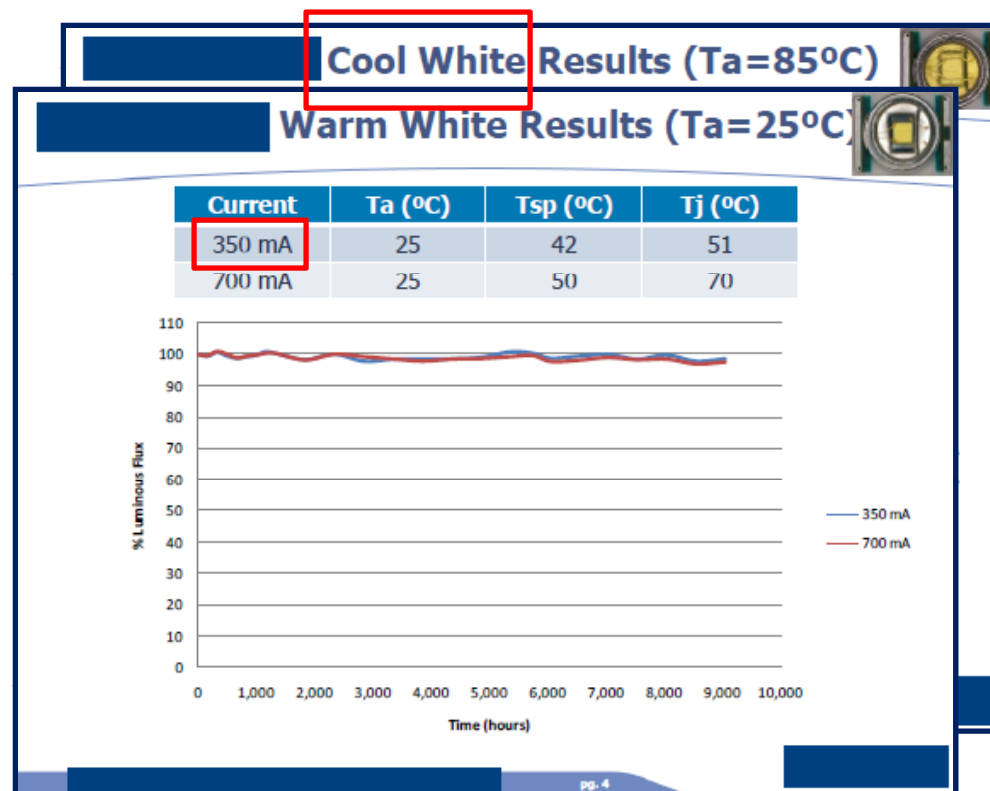
# LM-80 Checklist

- Report produced by a qualified test lab (if applicable)
- Consistent with submitted product
  - Product photos (if available)
  - Product description
    - CCT
    - Drive current

CCT
30=3000K
40=4000K

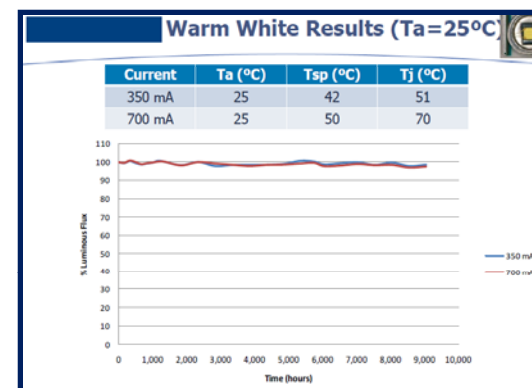
Energy Data:	
Input Power:	18W
Power Factor:	>0.92
Input Current:	0.3 Amps

Drive? 300 mA?



# LM-80 Checklist

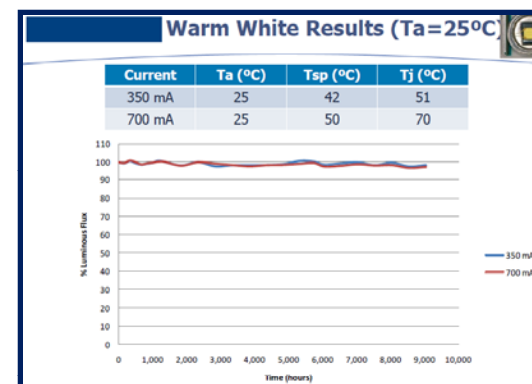
- ☐ During long-term operation
  - ☐ Three case temperatures: 55°C, 85°C, and another selected by manufacturer
    - ☐ Tolerance of - 2°C
  - ☐ Ambient within - 5°C of case temperature
  - ☐ Input current  $\pm 3\%$  of rated RMS
- ☐ During photometric measurements
  - ☐ 25°C ambient
    - ☐ Tolerance of  $\pm 2^\circ\text{C}$
  - ☐ Input current  $\pm 0.5\%$  of rated RMS
- ☐ Relative humidity < 65%



- ☐ Voltage
  - ☐ Input voltage conforms to rated input voltage and frequency of driver
  - ☐ Ripple  $\leq 2\%$  of output voltage (DC only)
- ☐ THD  $\leq 3\%$  of fundamental
- ☐ Thermocouple
  - ☐ Diagram shows location of attachment point
  - ☐ Complies with ASTM E230 Table 1 “Special Limits”
    - ☐  $\leq 1.1^{\circ}\text{C}$  or  $0.4\%$ , whichever is greater
- ☐ Time uncertainty of  $\pm 0.5\%$
- ☐ Product sampling method and sample size reported
- ☐ Catastrophic failures reported

# LM-80 Checklist

- ☐ Adequate number and duration of photometric measurements
  - ☒ Minimum 6,000 hours of testing
  - ☐ Maximum interval of 1,000 hours
  - ☐ Chromaticity shift reported
- ☐ Drive method reported
  - ☐ Forward<sub>VO</sub> Itage
  - ☐ Constant current
  - ☐ Same current for long-term operation and photometric measurements
  - ☐ Same current for each case temperature
    - Otherwise can't interpolate!





# Final Punch (DLC QPL)



Application	Minimum Light Output	Zonal Lumen Requirements	Minimum Luminaire Efficacy	Allowable CCTs (ANSI C78.377-2008)	Minimum CRI	Minimum LED Lumen Maintenance at 6000hrs <sup>1</sup>	Minimum Luminaire Warranty
5. Track or Mono-point Directional Lighting Fixtures	250 lm	$\geq 85\%$ 0-90°	30 lm/W	2700K, 3000K, 3500K, 4000K, 5000K	50	95.8%	N/A

Luminaire: Cast black enamel aluminum heatsink housing  
Lamp: Seven white LEDs with clear plastic optics and fr  
LED Power Supply: One  
Luminaire Efficacy: 41.7 Lumens/Watt

Luminaire Input Voltage	Input Current	Luminaire Watts	Power Factor
120.0VAC	0.1561A	18.57W	0.991
Radiant Flux mW	Luminous Flux lumen	Corr.Color Temperature K	Color Rend. Index Ra
2553.00	774.100	3051	81.7

# Final Punch (DLC QPL)



Application	Minimum Light Output	Zonal Lumen Requirements	Minimum Luminaire Efficacy	Allowable CCTs (ANSI C78.377-2008)	Minimum CRI	Minimum LED Lumen Maintenance at 6000hrs <sup>1</sup>	Minimum Luminaire Warranty
5. Track or Mono-point Directional Lighting Fixtures	250 lm	>= 85% 0-90°	30 lm/W	2700K, 3000K, 3500K, 4000K, 5000K	50	95.8%	N/A

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120.0VAC	0.1561A	18.57W	0.991
Radiant Flux mW	Luminous Flux lumen	Corr.Color Temperature K	Color Rend. Index Ra
2553.00	774.100	3051	81.7

- No spatial/gonio data submitted

# Final Punch (DLC QPL)



Application	Minimum Light Output	Zonal Lumen Requirements	Minimum Luminaire Efficacy	Allowable CCTs (ANSI C78.377-2008)	Minimum CRI	Minimum LED Lumen Maintenance at 6000hrs <sup>1</sup>	Minimum Luminaire Warranty
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2553.00	774.100	3051	81.7

# Final Punch (DLC QPL)



Application	Minimum Light Output	Zonal Lumen Requirements	Minimum Luminaire Efficacy	Allowable CCTs (ANSI C78.377-2008)	Minimum CRI	Minimum LED Lumen Maintenance at 6000hrs <sup>1</sup>	Minimum Luminaire Warranty
5. Track or Mono-point Directional Lighting Fixtures	250 lm	$\geq 85\%$ 0-90°	30 lm/W	2700K, 3000K, 3500K, 4000K, 5000K	50	95.8%	N/A

Luminaire: Cast black enamel aluminum heatsink housing  
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LED Power Supply: One  
Luminaire Efficacy: 41.7 Lumens/Watt

Luminaire Input Voltage	Input Current	Luminaire Watts	Power Factor
120.0VAC	0.1561A	18.57W	0.991
Radiant Flux mW	Luminous Flux lumen	Corr.Color Temperature K	Color Rend. Index Ra
2553.00	774.100	3051	81.7

Nominal CCT <sup>1)</sup>	Target CCT and tolerance (K)	Target Duv and tolerance
2700 K	2725 $\pm$ 145	0.000 $\pm$ 0.006
3000 K	3045 $\pm$ 175	0.000 $\pm$ 0.006

# Final Punch (DLC QPL)



Application	Minimum Light Output	Zonal Lumen Requirements	Minimum Luminaire Efficacy	Allowable CCTs (ANSI C78.377-2008)	Minimum CRI	Minimum LED Lumen Maintenance at 6000hrs <sup>1</sup>	Minimum Luminaire Warranty
5. Track or Mono-point Directional Lighting Fixtures	250 lm	$\geq 85\%$ 0-90°	30 lm/W	2700K, 3000K, 3500K, 4000K, 5000K	50	95.8%	N/A

Luminaire: Cast black enamel aluminum heatsink housing  
Lamp: Seven white LEDs with clear plastic optics and fr  
LED Power Supply: One  
Luminaire Efficacy: 41.7 Lumens/Watt

Luminaire Input Voltage	Input Current	Luminaire Watts	Power Factor
120.0VAC	0.1561A	18.57W	0.991
Radiant Flux mW	Luminous Flux lumen	Corr.Color Temperature K	Color Rend. Index Ra
2553.00	774.100	3051	81.7

# Final Punch (DLC QPL)



Application	Minimum Light Output	Zonal Lumen Requirements	Minimum Luminaire Efficacy	Allowable CCTs (ANSI C78.377-2008)	Minimum CRI	Minimum LED Lumen Maintenance at 6000hrs <sup>1</sup>	Minimum Luminaire Warranty
5. Track or Mono-point Directional Lighting Fixtures	250 lm	$\geq 85\%$ 0-90°	30 lm/W	2700K, 3000K, 3500K, 4000K, 5000K	50	95.8%	N/A

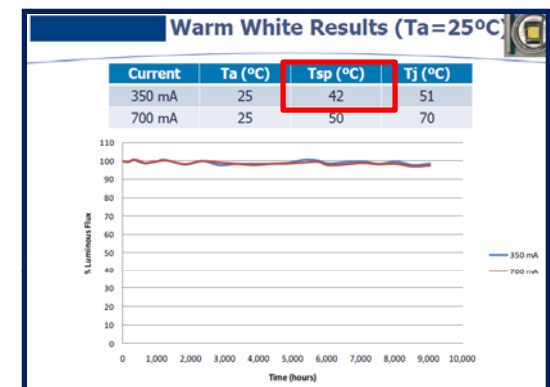
☐ Drive current

☐  $LM-79_{\text{reported}} \leq ISTMT_{\text{reported}} \leq LM-80_{\text{measured}}$

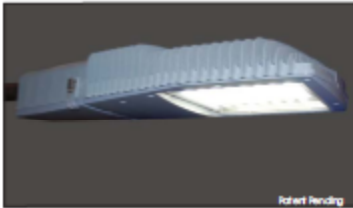
☐  $TMP_{LED}$  (measured)

☒  $ISTMT \leq LM-80_{\text{max}}$

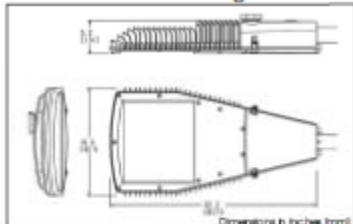
Description	RAW	Adj.	3 Hr Up	Td	St
1 DRIVER CASE	48.7	49	0	0	✓
2 LED BOARD	50.9	51	0	0	✓
3 POINT OF CONTACT	28.3	28	0	0	✓
4 TRACK ADAPTOR TOP	30.0	30	0	0	✓
5 HOUSING SIDE	26.2	26	0	0	✓



# Sample Submittal #2



**LED Street Light**



Dimensions in inches (mm)

**Mechanical Information:**

**Fixture Weight:** <39 lbs (and load weight)

**Mounting:** Accommodates a 2" P (2.375" OD) pipe. Provision for adjustment of 4"-5" in 2.5" increments.

**Vibration Resistance:** AVG C136.31

**Electrical specifications:**

**Operating Voltage:** Standard: 100-277V (+10/-20%)  
Optional: 547-600V nominal (+10/-20%)

**Total System Power Consumption:** See Ordering Info below

**Operating Temp:** -40°C to 74°C (-40°F to 165°F)  
With built-in thermal overload protection circuitry

**Notes & Requirements / EMC:** FCC Title 47, Subpart B, Section 15, class A device. RF Immunity: 10V/m, 80MHz-1GHz

**Transient Protection:** AVG C136.2 (600V class/option) - Dielectric and transient voltage withstand tests

**TBD:** <5% (120VAC)  
<10% (240VAC)  
<12% (277VAC)

**Power Factor:** > 0.95

**Materials:**

**Housing:** Cast aluminum housing with terminal block for up to 6WAG wires. Unique Ringed grey polycarbonate bottom cover provides tool-less access to terminal block and pipe fitting for quick luminaire mounting.

**Finish:** Polyester powder coat grey. Standard RAL 7035. (Other finish options available on request)

**Lens:** UV and abrasion resistant polycarbonate cover lens. (Glass lens options available on request)

**Photocell/Sensor:** Standard NEMA three pin field lock, socket with shading cap, perper AVG C136.10

**Photocell:** Optional (ordered separately)

**Electromagnetic Interference:**

**CRI (typ):** 70

**CCT (typ):** 6000K (cool white)

**Other color options:** available on request

**Options:** ES Type II; Dark Sky Compliant; Full cut-off fixture. (Other options available on request)

Model 100-001-01  
Meets or exceeds requirements  
under the American National  
Standard ANSI Z83.7

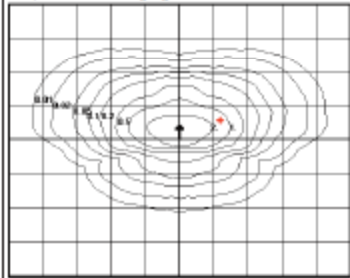
**Order Codes:**

Part Number	LED Drive Current (mA)	Total System Power Consumption (W)	Initial Return Lumens	UM-79	LM-80
SDC06LGH	315	131	65.01	✓	✓
SDC06LGH	315	65	34.09	✓	✓

## - Light Measurement Data

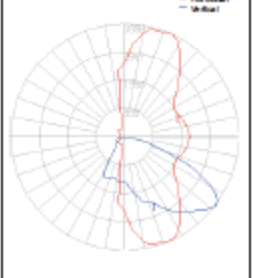
**Iso-Illuminance Chart (fc)**

Example shown: 30 ft mounting height



= Part of non-uniformity

**Intensity Distribution Curve (cd)**



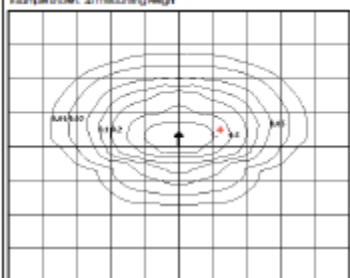
= Part of non-uniformity

IESNA RP-8-00 Compliant

## - Light Measurement Data

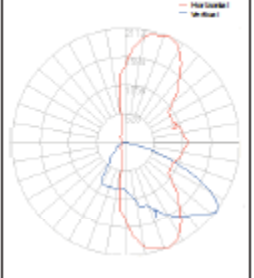
**Iso-Illuminance Chart (fc)**

Example shown: 30 ft mounting height



= Part of non-uniformity

**Intensity Distribution Curve (cd)**



= Part of non-uniformity

IESNA RP-8-00 Compliant

The most current version of this document will always be available at  
[www.fedex.com/energy\\_efficiency/And\\_Catalogs/Illuminatory/IESNA/IESNA001](http://www.fedex.com/energy_efficiency/And_Catalogs/Illuminatory/IESNA/IESNA001)

IES file and other photometric data available upon request. IESNA001\_0

☑ Report produced by a qualified test lab



[www1.eere.energy.gov/buildings/ssl/test\\_labs.html](http://www1.eere.energy.gov/buildings/ssl/test_labs.html)

(as of 8/4/10)

#### Laboratories Performing Integrating Sphere Testing for CALiPER

- [Independent Testing Laboratories Inc.](#) - Boulder, CO
- [Intertek](#) - Cortland, NY
- [Luminaire Testing Laboratory Inc.](#) - Allentown, PA
- [Lighting Sciences Inc.](#) - Scottsdale, AZ
- [OnSpeX/CSA International](#) - Atlanta, GA
- Aurora International Testing Laboratory ([PDF 3.0 MB](#)) - Aurora, OH
- [Orb Optronix Inc.](#) - Kirkland, WA

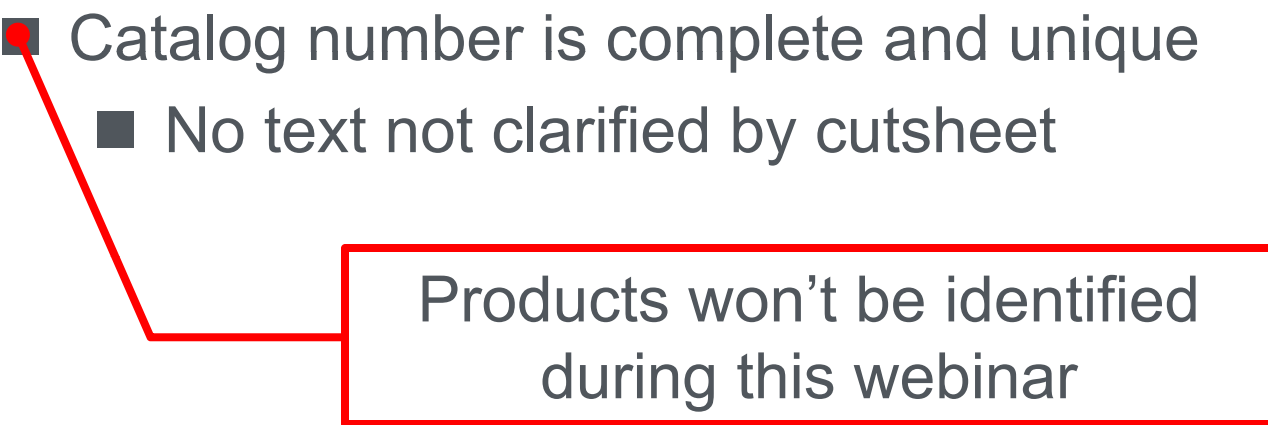
#### Laboratories Performing Goniophotometry Testing for CALiPER

- [Independent Testing Laboratories Inc.](#) - Boulder, CO
- [Intertek](#) - Cortland, NY
- [Luminaire Testing Laboratory Inc.](#) - Allentown, PA
- [Lighting Sciences Inc.](#) - Scottsdale, AZ
- [OnSpeX/CSA International](#) - Atlanta, GA



- ☒ Data manipulation by supplier appears unlikely
  - ☒ PDF is preferred
  - ☒ Test lab letterhead (original)

- ☐ Consistent with submitted product and cutsheet\*
  - ☒ Catalog number is complete and unique
    - ☐ No text not clarified by cutsheet



Products won't be identified  
during this webinar

\* Or meets Product Group/Family criteria

# LM-79 Checklist

- ☐ Consistent with submitted product and cutsheet\*
  - ☐ Product description
  - ☒ Input current, voltage, and wattage

LED Drive Current (mA)	Total System Power Consumption (W)	Initial Fixture Lumens
315	131	6581
315	65	3489

Power Factor: >0.95

Photometric and Electrical Measurements – Distribution Method							
Intertek Sample No.	Base Orientation	Input Voltage (Vac)	Input Current (mA)	Input Power (Watts)	Input Power Factor	Absolute Luminous Flux (Lumens)	Lumen Efficacy (Lumens Per Watt)
	UP	120.0	552.3	65.67	0.9895	3489	53.13

\* Or meets Product Group/Family criteria

- ☐ Consistent with submitted product and cutsheet\*
  - ☐ Product description
  - ☐ Number of LEDs

\* Or meets Product Group/Family criteria

# LM-79 Checklist

- ☐ Consistent with submitted product and cutsheet\*
  - ☐ Product description
  - ☒ CCT

## Photometric Information:

**CRI (typ):** 70

**CCT (typ):** 6000K (cool white)  
*(Other color options available on request)*

**Optics:** IES Type II; Dark sky Compliant Full cut-off fixture.  
*(Other Types available on request)*

Criteria	Result
Total Lumen Output	3,488.8
Total Power	65.67W
Luminaire Efficacy	53.13
Power Factor	0.9895
Color Rendering Index (CRI)	73.0
Correlated Color Temperature (CCT)	5855K
Chromaticity Coordinate (x)	0.3246
Chromaticity Coordinate (y)	0.3389
Chromaticity Coordinate (u')	0.2023
Chromaticity Coordinate (v')	0.4753
Backlight Rating:	B1
Uplight Rating:	U0
Glare Rating:	G0
Maximum In-Situ Temperature	37.8°C

\* Or meets Product Group/Family criteria

# LM-79 Checklist

- ☐ Consistent with submitted product and cutsheet\*
  - ☐ Product description
    - ☐ No thermal management not indicated on cutsheet
    - ☒ Optical distribution *appears to be* worst-case

<u>Photometric Information:</u>	
CRI (typ):	70
CCT (typ):	6000K (cool white) (Other color options available on request)
<b>Optics:</b>	IES Type II; Dark sky Compliant Full cut-off fixture. (Other Types available on request)



\* Or meets Product Group/Family criteria

# LM-79 Checklist

- ☑ No apparent errors attributable to manual entry
- ☑  $PF = 65.67W / 120V / 0.5523A$
- ☑  $Efficacy = 3489 \text{ lm} / 65.67W$

Photometric and Electrical Measurements – Distribution Method							
Intertek Sample No.	Base Orientation	Input Voltage (Vac)	Input Current (mA)	Input Power (Watts)	Input Power Factor	Absolute Luminous Flux (Lumens)	Lumen Efficacy (Lumens Per Watt)
	UP	120.0	552.3	65.67	0.9895	3489	53.13

# ISTMT Checklist

- ☑ Report produced by a qualified test lab
- ☑ Data manipulation by supplier appears unlikely
  - ☑ PDF is preferred
  - ☑ Test lab letterhead (original)

Organizations Currently Recognized by OSHA as NRTLs	
<a href="#">Canadian Standards Association (CSA)</a> (also known as CSA International)	
<a href="#">Communication Certification Laboratory, Inc. (CCL)</a>	
<a href="#">Curtis-Straus LLC (CSL)</a>	
<a href="#">FM Approvals LLC (FM)</a> (formerly Factory Mutual Research Corporation)	
<a href="#">Intertek Testing Services NA, Inc. (ITSNA)</a> (formerly ETL)	
<a href="#">MET Laboratories, Inc. (MET)</a>	
<a href="#">NSF International (NSF)</a>	
<a href="#">National Technical Systems, Inc. (NTS)</a>	
<a href="#">SGS U.S. Testing Company, Inc. (SGSUS)</a> (formerly UST-CA)	
<a href="#">Southwest Research Institute (SWRI)</a>	
<a href="#">TÜV SÜD America, Inc. (TUVAM)</a>	
<a href="#">TÜV SÜD Product Services GmbH (TUVPSG)</a>	
<a href="#">TUV Rheinland of North America, Inc. (TUV)</a>	
<a href="#">Underwriters Laboratories Inc. (UL)</a>	
<a href="#">Wyle Laboratories, Inc. (WL)</a>	

(as of 8/6/10)

**Intertek**

RESULTS OF TESTS (cont'd)

In-Situ Maximum Measured Power Supply Case and LED Source Point Temperature



- ☐ Consistent with submitted product and cutsheet\*
  - Catalog number
    - No portions not clarified by cutsheet
- ☐ Product description and photos or diagrams
  - ☐ No thermal management not indicated on cutsheet
  - ☒ Input current, voltage, and power
    - Combined with LM-79 report



\* Or meets Product Group/Family criteria

# LM-80 Checklist

- Report produced by a qualified test lab (if applicable)
- ☐ Consistent with submitted product
  - ☐ Product photos (if available)
  - ☒ Product description
  - ☒ Drive current

LED Drive Current (mA)	Total System Power Consumption (W)	Initial Fixture Lumens
315	131	6581
315	65	3489

The thermal characterization results are summarized in the table below. In all cases,  $T_S$  and  $T_A$  meet or exceed the IES LM-80-08 limits (i.e.  $T_S \geq 55^\circ\text{C}$  or  $85^\circ\text{C}$ , and that  $T_A \geq T_S - 5^\circ\text{C}$ ).

Test	$I_F$	$T_S$	$T_A$	$\Delta [T_A - T_S]$	Relative Humidity
55°C	350mA	60°C	64°C	+4°C	18%
85°C	350mA	85°C	84°C	-1°C	7%
55°C	700mA	69°C	73°C	+4°C	18%
85°C	700mA	92°C	87°C	-5°C	7%
55°C	1000mA	71°C	80°C	+9°C	18%

# LM-80 Checklist

- Report produced by a qualified test lab (if applicable)
- ☐ Consistent with submitted product
  - ☐ Product photos (if available)
  - ☒ Product description
    - ☒ CCT
      - Not clearly indicated in LM-80 report

<u>Photometric Information:</u>	
CRI (typ):	70
CCT (typ):	6000K (cool white) <i>(Other color options available on request)</i>
Optics:	IES Type II; Dark sky Compliant Full cut-off fixture. <i>(Other Types available on request)</i>

Subject: LM-80 Test Report	Date: April 6, 2009 Rev: A
Cool-White [redacted] using [redacted] technology	

- ☐ During long-term operation
  - ☐ Three case temperatures: 55°C, 85°C, and another selected by manufacturer
    - *Tolerance of - 2°C*
      - More conservative using “≥” ?...
  - ☒ Ambient within - 5°C of case temperature
  - ☐ Input current  $\pm 3\%$  of rated RMS

The thermal characterization results are summarized in the table below. In all cases,  $T_S$  and  $T_A$  meet or exceed the IES LM-80-08 limits (i.e.  $T_S \geq 55^\circ\text{C}$  or  $85^\circ\text{C}$ , and that  $T_A \geq T_S - 5^\circ\text{C}$ ).

Test	$I_F$	$T_S$	$T_A$	$\Delta [T_A - T_S]$	Relative Humidity
55°C	350mA	60°C	64°C	+4°C	18%
85°C	350mA	85°C	84°C	-1°C	7%
55°C	700mA	69°C	73°C	+4°C	18%
85°C	700mA	92°C	87°C	-5°C	7%
55°C	1000mA	71°C	80°C	+9°C	18%

?

# LM-80 Checklist

- ☐ During photometric measurements
  - ☐ 25°C ambient
    - ☐ Tolerance of  $\pm 2^\circ\text{C}$
  - ☐ Input current  $\pm 0.5\%$  of rated RMS
- ☒ Relative humidity  $< 65\%$

The thermal characterization results are summarized in the table below. In all cases,  $T_S$  and  $T_A$  meet or exceed the IES LM-80-08 limits (i.e.  $T_S \geq 55^\circ\text{C}$  or  $85^\circ\text{C}$ , and that  $T_A \geq T_S - 5^\circ\text{C}$ ).

Test	$I_F$	$T_S$	$T_A$	$\Delta [T_A - T_S]$	Relative Humidity
55°C	350mA	60°C	64°C	+4°C	18%
85°C	350mA	85°C	84°C	-1°C	7%
55°C	700mA	69°C	73°C	+4°C	18%
85°C	700mA	92°C	87°C	-5°C	7%
55°C	1000mA	71°C	80°C	+9°C	18%

## ☐ Voltage

- ☐ Input voltage conforms to rated input voltage and frequency of driver
- ☐ Ripple  $\leq 2\%$  of output voltage (DC only)
- ☐ THD  $\leq 3\%$  of fundamental

- ☐ Thermocouple
  - Diagram shows location of attachment point
  - ☐ Complies with ASTM E230 Table 1 “Special Limits”
    - ☐  $\leq 1.1^{\circ}\text{C}$  or 0.4%, whichever is greater
- ☐ Time uncertainty of  $\pm 0.5\%$
- ☐ Product sampling method and sample size reported
- ☐ Catastrophic failures reported

**10. Observation of LED light source failures including the failure conditions and time of failure**

Individual LED failures did occur in some data sets, which are not included in the attached tables. Failures may have been caused by manual handling during the data collection process. Root cause investigations are ongoing.

# LM-80 Checklist

- ☑ Adequate number and duration of photometric measurements
  - ☑ Minimum 6,000 hours of testing
  - ☑ Maximum interval of 1,000 hours
  - ☑ Chromaticity shift reported

DATA SET 1		STRESS: 55C, 0.35A												
		$T_s = 60C$												
		$T_A = 64C$												
		RH = 18%												
Lumen Data														
		0	24	168	500	1000	2000	3000	4000	5000	6000	7000	8000	9000
		63.247	63.205	64.030	64.528	64.257	63.765	63.749	63.753	63.745	62.567	63.271	63.352	62.708
		62.936	62.978	63.842	64.038	63.901	63.432	63.851	64.119	64.085	62.828	63.821	63.799	63.252

DATA SET 1		STRESS: 55C, 0.35A												
		$T_s = 60C$												
		$T_A = 64C$												
		RH = 18%												
Delta u' v'														
		0	24	168	500	1000	2000	3000	4000	5000	6000	7000	8000	9000
		0.0000	0.0002	0.0001	0.0003	0.0001	0.0022	0.0021	0.0019	0.0016	0.0017	0.0015	0.0015	0.0010



# LM-80 Checklist

- ☐ Drive method reported
  - ☒ Forward voltage
  - ☒ Constant current
- ☐ Same current for long-term operation and photometric measurements
- ☒ Same current for each case temperature
  - Otherwise can't interpolate!

DATA SET 1		STRESS: 55C, 0.35A					
		$T_s = 60C$					
		$T_A = 64C$					
		RH = 18%					
		VF RAW DATA					
		0	24	168	500	1000	2000
		3.543	3.324	3.317	3.317	3.290	3.276
		3.530	3.333	3.344	3.343	3.300	3.274

## 4. Operating cycle

LEDs are driven with a constant dc current.

Test	$I_f$	$T_s$	$T_A$	$\Delta [T_A - T_s]$	Relative Humidity
55°C	350mA	60°C	64°C	+4°C	18%
85°C	350mA	85°C	84°C	-1°C	7%
55°C	700mA	69°C	73°C	+4°C	18%
85°C	700mA	92°C	87°C	-5°C	7%
55°C	1000mA	71°C	80°C	+9°C	18%

# Final Punch (DLC QPL)



Application	Minimum Light Output	Zonal Lumen Requirements	Minimum Luminaire Efficacy	Allowable CCTs (ANSI C78.377-2008)	Minimum CRI	Minimum LED Lumen Maintenance at 6000hrs¹	Minimum Luminaire Warranty
1. Outdoor Pole/Arm-Mounted Area and Roadway Luminaires	1,000 lm	=100% 0-90°, <10 % 80-90°	50 lm/W	<6500K	50	95.8%	N/A

Criteria	Result
Total Lumen Output	3,488.8
Total Power	65.67W
Luminaire Efficacy	53.13
Power Factor	0.9895
Color Rendering Index (CRI)	73.0
Correlated Color Temperature (CCT)	5855K
Chromaticity Coordinate (x)	0.3246
Chromaticity Coordinate (y)	0.3389
Chromaticity Coordinate (u')	0.2023
Chromaticity Coordinate (v')	0.4753
Backlight Rating:	B1
Uplight Rating:	U0
Glare Rating:	G0
Maximum In-Situ Temperature	37.8°C

# Final Punch (DLC QPL)



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Zonal Lumens and Percentages at 25°C

Zone	Lumens	% Luminaire
0-10	90.0	2.6
10-20	285.4	8.2
20-30	455.2	13.0
30-40	584.6	16.8
40-50	700.3	20.1
50-60	742.3	21.3
60-70	480.2	13.8
70-80	143.6	4.1
80-90	7.3	0.2

- 100.1% from 0° to 90°
  - Rounding error (negligible)

# Final Punch (DLC QPL)



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Application	Minimum Light Output	Zonal Lumen Requirements	Minimum Luminaire Efficacy	Allowable CCTs (ANSI C78.377-2008)	Minimum CRI	Minimum LED Lumen Maintenance at 6000hrs¹	Minimum Luminaire Warranty
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# Final Punch (DLC QPL)

Application	Minimum Light Output	Zonal Lumen Requirements	Minimum Luminaire Efficacy	Allowable CCTs (ANSI C78.377-2008)	Minimum CRI	Minimum LED Lumen Maintenance at 6000hrs <sup>1</sup>	Minimum Luminaire Warranty
1. Outdoor Pole/Arm-Mounted Area and Roadway Luminaires	1,000 lm	=100% 0-90°, <10 % 80-90°	50 lm/W	<6500K	50	95.8%	N/A

☒ Drive current

☒  $LM-79_{reported} \leq ISTMT_{reported} \leq LM-80_{measured}$

☐  $TMP_{LED}$  (measured)

☐  $ISTMT \leq LM-80_{max}$

LED Drive Current (mA)	Total System Power Consumption (W)	Initial Fixture Lumens
315	131	6581
315	65	3489

Test	$I_F$	$T_S$	$T_A$	$\Delta [T_A - T_S]$	Relative Humidity
55°C	350mA	60°C	64°C	+4°C	18%
85°C	350mA	85°C	84°C	-1°C	7%
55°C	700mA	69°C	73°C	+4°C	18%

# Final Punch (DLC QPL)

Application	Minimum Light Output	Zonal Lumen Requirements	Minimum Luminaire Efficacy	Allowable CCTs (ANSI C78.377-2008)	Minimum CRI	Minimum LED Lumen Maintenance at 6000hrs <sup>1</sup>	Minimum Luminaire Warranty
1. Outdoor Pole/Arm-Mounted Area and Roadway Luminaires	1,000 lm	=100% 0-90°, <10 % 80-90°	50 lm/W	<6500K	50	95.8%	N/A

☑ Drive current

☑  $LM-79_{\text{reported}} \leq ISTMT_{\text{reported}} \leq LM-80_{\text{measured}}$

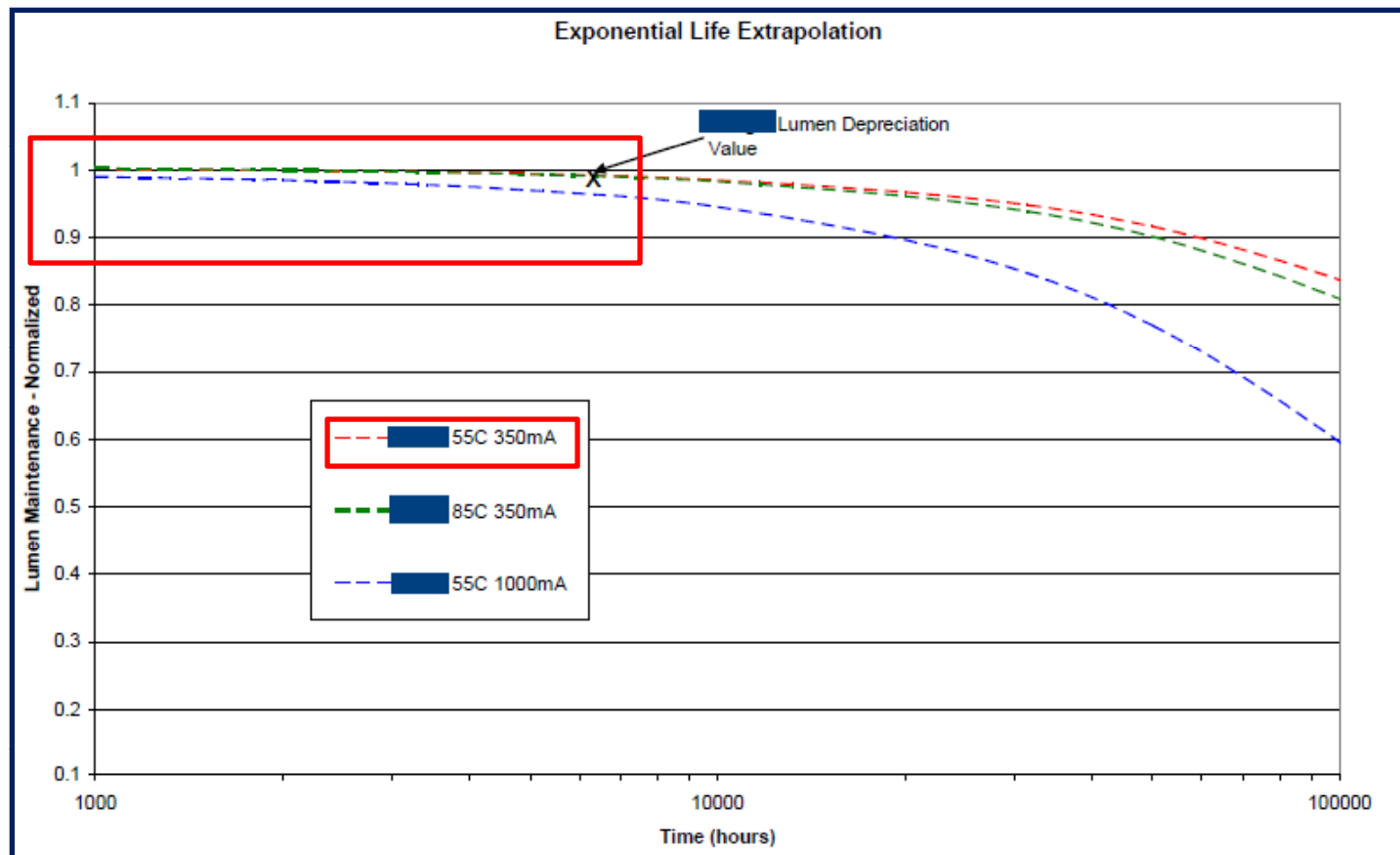
☑  $TMP_{LED}$  (measured)

☑  $ISTMT \leq LM-80_{\text{max}}$

Maximum Measured Manufacturer Designated Source Temperature				
Sample No.	Model	Maximum Measured Source Temperature (C°)	Location	Maximum Rated Source Temperature (C°)
		37.8	Thermal pad in on LED central to array	137



- Resubmitted with chart approx per NEEP requirements
  - No interpolation necessary (Scenario 2)





Application	Minimum Light Output	Zonal Lumen Requirements	Minimum Luminaire Efficacy	Allowable CCTs (ANSI C78.377-2008)	Minimum CRI	Minimum LED Lumen Maintenance at 6000hrs <sup>1</sup>	Minimum Luminaire Warranty
1. Outdoor Pole/Arm-Mounted Area and Roadway Luminaires	1,000 lm	=100% 0-90°, <10 % 80-90°	50 lm/W	<6500K	50	95.8%	N/A

- Notes regarding problems common among submittals
  - **Did not** strictly adhere to LM-80
    - T<sub>s</sub> location not indicated in long-term report
    - T<sub>s</sub> tolerance not per LM-80
    - Numerous long-term test conditions unclear
  - In situ LED drive current is *rated*, **not** *measured*
  - Make/model of LED package/module is **not** independently verified

# Another Example

- Long-term ambient temperature = 25°C?
  - Or just during photometric testing?

LM-80 Report

December 15, 2009

1. Number of LED sources

25pcs per test.

2. Description of LED sources

Single LED package containing wire bonded InGaN die covered in phosphor and attached to MCPCB  
The report is applied to the following products.

3. Description of Auxillary Equipment.

LED+Sn-Ag-Cu Solder+Substrate for Testing

4. Operating Cycle.

DC driving.

5. Ambient Conditions

25 ° C, 30% relative humidity, stagnant air.

6. Case Temperature (Tc)

Table-1 LM-80 Test condition

Tc (deg C)	Drive current(mA)	Relative humidity	Average Lumen Maintenance
85	20	8%	96.9%
55	20	17%	98.6%
25	20	28%	99.5%

7. Drive Current

20 mA.

8. Initial Luminous flux and forward voltage

Typ 6.4lm, Typ 3.2V.

9. Lumen Maintenance DATA

Refer to Table-2, Table-4and Chart-1-1,1-2,1-3 .

Table-2 LM list

Tc (deg C)	Chart
85	1-1
55	1-2
25	1-3

10. Observation of LED Light Source failures

No crack or abnormality was observed.

11. LED light source monitoring interval

1000H.

Thank you!

Questions?